

**What is claimed is:**

1. An electroluminescent device having a cathode and an anode, an organic light emitting layer (LEL) containing at least one organic host material and a light emitting first dopant, and a layer containing a stabilizing second dopant wherein:

a) the organic host material is capable of sustaining both hole and electron injection and recombination of electrons and holes; and

b) the first dopant is a green light emitting organic material capable of accepting energy from the electron-hole recombination in the host material and of accepting energy transferred from the second dopant and is selected to have a bandgap energy lower than or equal to the bandgap energy of the second dopant material;

c) the second dopant is a stabilizing material capable of accepting energy of electron-hole recombination in the host material, the second dopant being selected to have a bandgap energy lower than the bandgap energy of the host material, but higher or equal to the first dopant;

wherein emissions from the first dopant and emissions from the second dopant, if any, have a peak emission in the OLED device less than 570 nm.

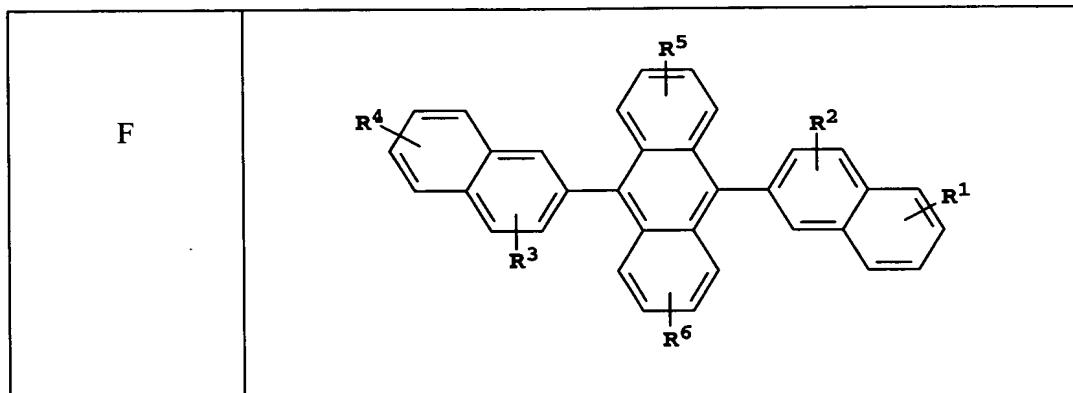
2. The device of claim 1 wherein the second dopant is located in the Light Emitting Layer LEL.

3. The device of claim 1 wherein both the stabilizing second dopant and the first dopant emit green light with peak emission in the OLED device in the range of 490–540 nm.

4. The device of claim 1 wherein the dopants are each independently present in an amount of up to 10 wt % of the host.

5. The device of claim 1 wherein the first dopant is present in an amount of less than 3 wt% of the host, and the second dopant is present in an amount less than 5 wt% of the host.
6. The device of claim 1 wherein both the first dopant and the second dopant are present independently in amounts of 0.5-1.0% of the host
7. The device of claim 1 comprising in the LEL a first host material, a second host material or a mixture of a first host and a second host material.
8. The device of claim 7 wherein the first host comprises a chelated oxinoid compound.
9. The device of claim 8 wherein the chelated oxinoid compound comprises a member selected from the group consisting of:
  - Aluminum trisoxine [alias, tris(8-quinolinolato)aluminum(III)];
  - Magnesium bisoxine [alias, bis(8-quinolinolato)magnesium(II)];
  - Bis[benzo {f}-8-quinolinolato]zinc (II);
  - Bis(2-methyl-8-quinolinolato)aluminum(III)- $\mu$ -oxo-bis(2-methyl-8-quinolinolato) aluminum(III);
  - Indium trisoxine [alias, tris(8-quinolinolato)indium];
  - Aluminum tris(5-methyloxine) [alias, tris(5-methyl-8-quinolinolato)aluminum(III)];
  - Lithium oxine [alias, (8-quinolinolato)lithium(I)];
  - Gallium oxine [alias, tris(8-quinolinolato)gallium(III)]; and
  - Zirconium oxine [alias, tetra(8-quinolinolato)zirconium(IV)].
10. The device of claim 8 wherein the first host comprises Aluminum trisoxine [alias, tris(8-quinolinolato)aluminum(III)].

11. The device of claim 8 wherein the second host comprises an anthracene compound comprising derivatives of 9,10-di-(2-naphthyl)anthracene (Formula F)



wherein:  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ , and  $R^6$  represent one or more substituents on each ring where each substituent is individually selected from the following groups:

Group 1: hydrogen, or alkyl of from 1 to 24 carbon atoms;

Group 2: aryl or substituted aryl of from 5 to 20 carbon atoms;

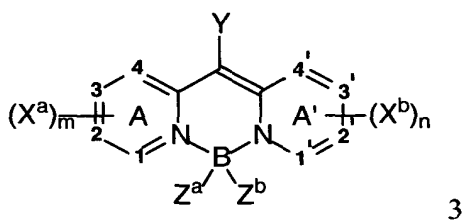
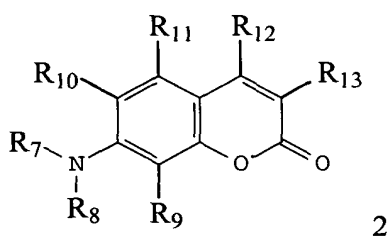
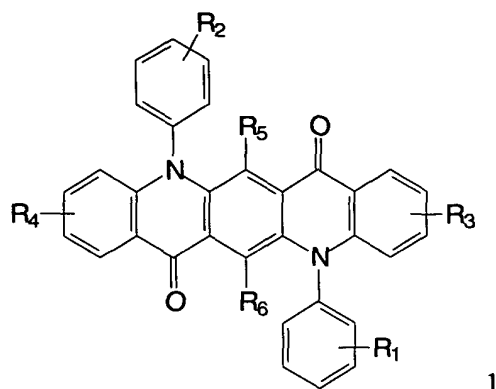
Group 3: carbon atoms from 4 to 24 necessary to complete a fused aromatic ring of anthracenyl; pyrenyl, or perylenyl;

Group 4: heteroaryl or substituted heteroaryl of from 5 to 24 carbon atoms as necessary to complete a fused heteroaromatic ring of furyl, thienyl, pyridyl, quinolinyl or other heterocyclic systems;

Group 5: alkoxyamino, alkylamino, or arylamino of from 1 to 24 carbon atoms; and

Group 6: fluorine, chlorine, bromine or cyano.

12. The device of claim 1 where the first dopant comprises a material of the Formula 1, 2 or 3:



wherein in Formula 1,  $R_1 - R_6$  represent hydrogen, one or more substituents such as halogen, alkyl, cyano group, nitro group, hydroxy, alkoxy group, aryloxy group, aryl group, an alkylthio group, arylthio group or an aromatic heterocycle.  $R_1$  or  $R_2$  may form a fused aromatic or heteroaromatic ring to the phenyl moiety.  $R_3$  and  $R_4$  do not form fused aromatic rings to the central quinacridone structure.

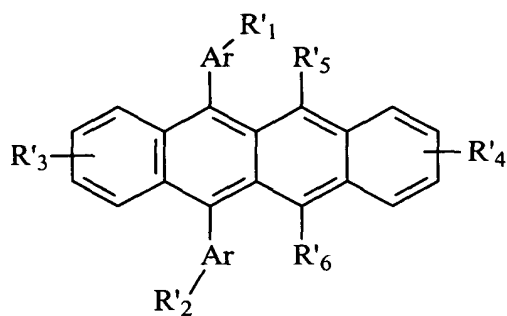
In Formula 2,  $R_9$ - $R_{13}$  independently represents hydrogen, halogen, alkyl, alkoxy, alkylthio group, arylthio group, aryl, an electron withdrawing group such as a cyano group, nitro group or trifluoromethyl group, an aromatic heterocycle, or an heterocyclic ring fused to the aromatic moiety.  $R_7$  and  $R_8$  independently represent an alkyl group, aryl group, an aromatic heterocycle or a heterocyclic group fused together, and/or fused to the aromatic moiety. All of the

ring substituents may be themselves further substituted, using substituents selected by those skilled in the art to attain a desired property.

In Formula 3, each  $X^a$  and  $X^b$  is an independently selected substituent, two of which may join to form a fused ring to the azine ring moiety; m and n are independently 0 to 4; Y is H or a substituent;  $Z^a$  and  $Z^b$  are independently selected substituents; 1, 2, 3, 4, 1', 2', 3', and 4' are independently selected as either carbon or nitrogen atoms. The device may desirably contain at least one or both of rings A and A', that contains substituents joined to form a fused ring. In one useful embodiment, there is present at least one  $X^a$  or  $X^b$  group selected from the group consisting of halide and alkyl, aryl, alkoxy, and aryloxy groups. In another embodiment, there is present a  $Z^a$  and  $Z^b$  group are independently selected from the group consisting of fluorine and alkyl, aryl, alkoxy and aryloxy groups. Y is suitably hydrogen or a substituent such as an alkyl, aryl, halogen, cyano group or a heterocyclic group.

13. The device of claim 12 wherein the first dopant is one of formula 1.
14. The device of claim 12 wherein the first dopant is one of formula 2.
15. The device of claim 12 wherein the first dopant is one of formula 3.
16. The device of claim 12 wherein the first dopant comprises: Inv-1a, Inv-6a or Inv-8a.
17. The device of claim 1 where the second dopant comprises a material of Formula 4':

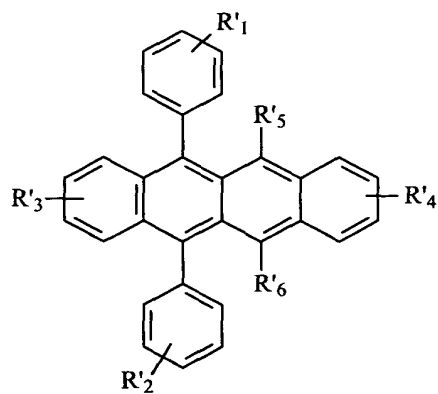
-46-



4

wherein each Ar is an aromatic carbocyclic or heterocyclic ring, R'<sub>1</sub>-R'<sub>6</sub> independently represent hydrogen or one or more substituents selected from halogen, cyano group, nitro group, an alkyl group, hydroxy, alkoxy group, aryloxy group, an alkylthio group, an amino group, an arylthio group, either an aryl group or an aromatic heterocycle, either of which can be fused to the phenyl moiety provided R'<sub>3</sub> and R'<sub>4</sub> do not form fused rings to the central naphthalene structure.

18. The device of claim 17 where the second dopant comprises a material of Formula 4''

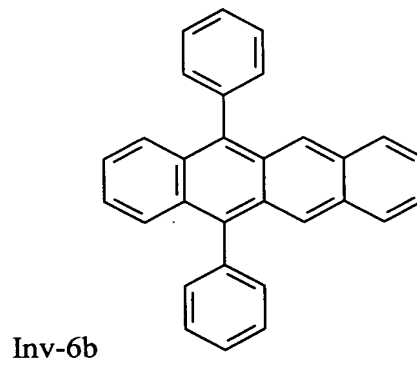
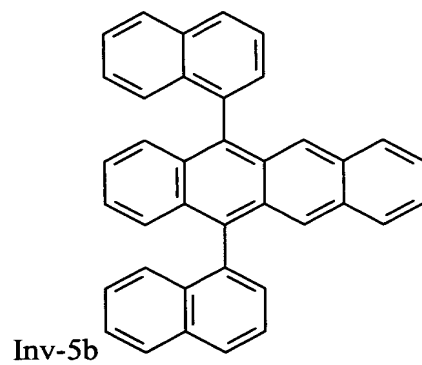
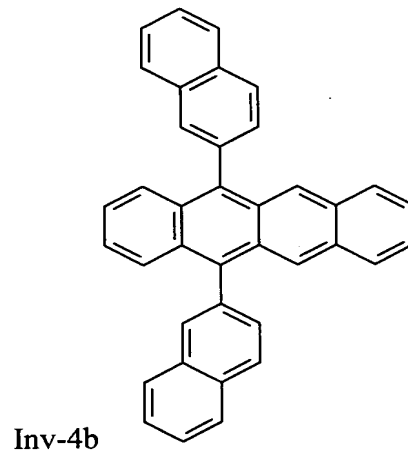
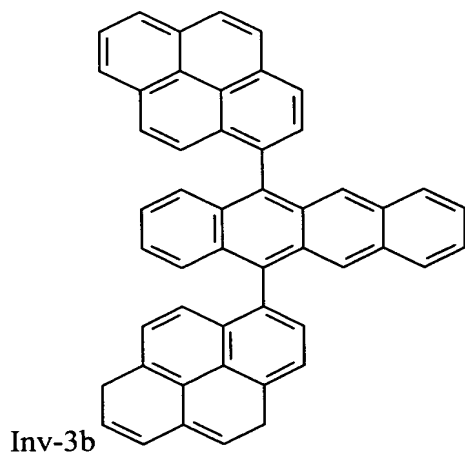
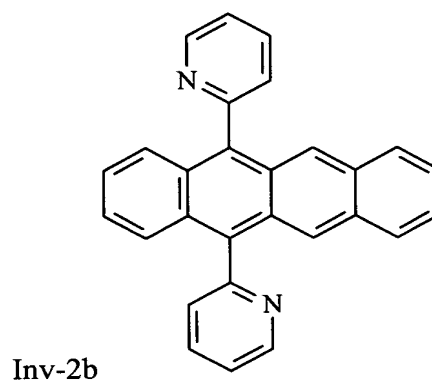
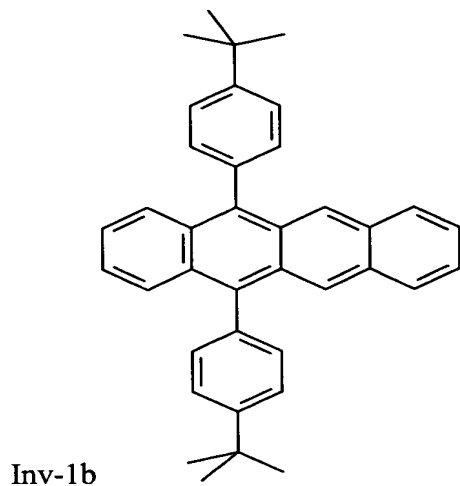


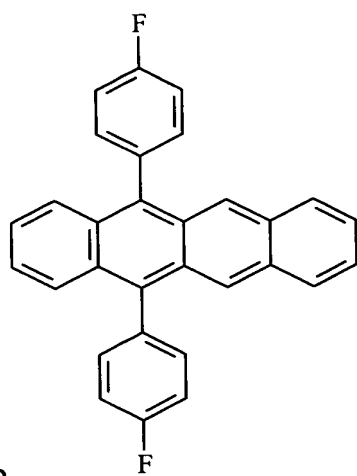
4''

19. The device of claim 17 wherein the second dopant is a 5,12-disubstituted tetracene or a derivative thereof.

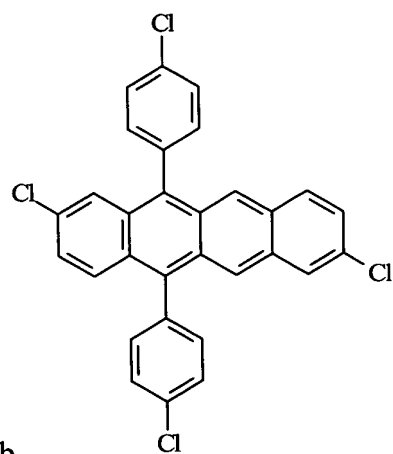
20. The device of claim 17 wherein the second dopant is a 5,12-diaryltetracene

21. The device of claim 17 wherein the second dopant is selected from the group consisting of

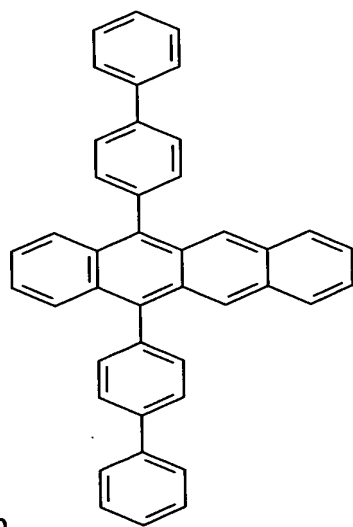




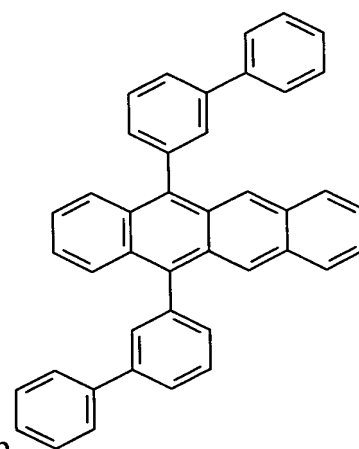
Inv-7b



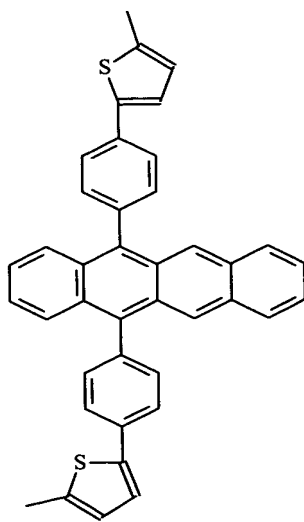
Inv-8b



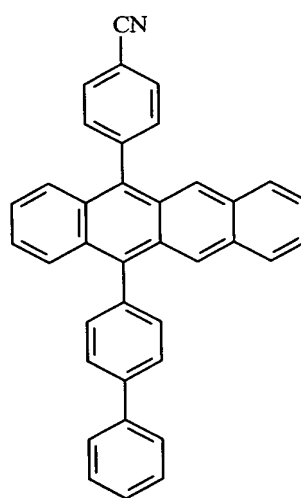
Inv-9b



Inv-10b

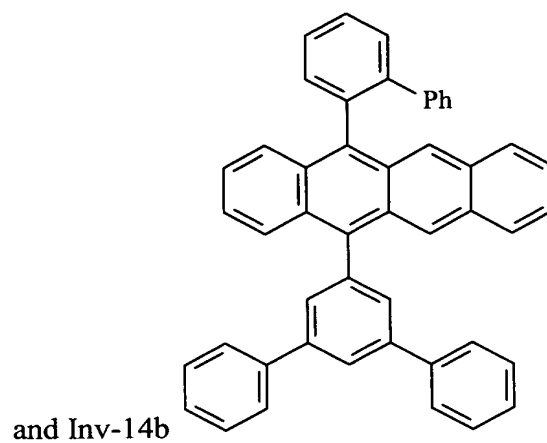
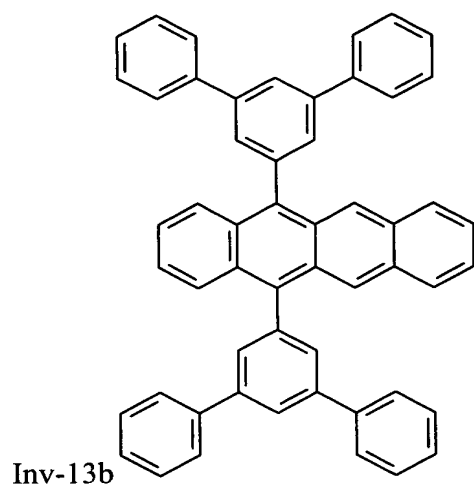


Inv-11b



Inv-12b





22. The device of claim 21 wherein the second dopant is Inv-1b or Inv-3b.